

5 The endocrine system and the nervous system both coordinate responses in mammals.

- (a) Complete Table 5.1 to show the features of three cell-signalling molecules of the endocrine system: antidiuretic hormone (ADH), glucagon and insulin.

Use a tick (✓) if the molecule has the feature and a cross (✗) if the molecule does **not** have the feature.

Put a tick (✓) or a cross (✗) in every box.

Table 5.1

feature	ADH	glucagon	insulin
binds to receptors on cell surface membranes			
results in molecules moving from cells into the blood			
is secreted as a result of detection by osmoreceptors			

[3]

- (b)** The endocrine system has a slower transmission speed than the nervous system.

Describe **other** ways in which the endocrine system and the nervous system differ.

..... [4]

[4]

- (c) The endocrine system and the nervous system can affect muscle function.

Fig. 5.1 shows a transmission electron micrograph of a longitudinal section of striated muscle tissue that is in a relaxed state.

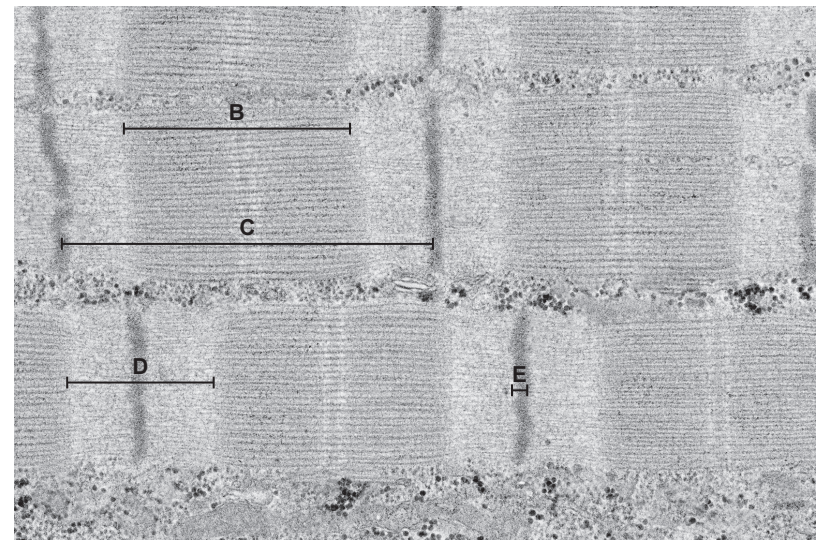


Fig. 5.1

- (i) State the letter on Fig. 5.1 that indicates the length of a sarcomere.

..... [1]

- (ii) State the letter on Fig. 5.1 that indicates a region where actin and myosin overlap.

..... [1]

- (iii) Describe **and** explain how the region labelled **D** on Fig. 5.1 changes during muscle contraction.

[4]

[4]

Figure 1 is a coronal CT scan of the abdomen. It shows a large, heterogeneous, enhancing mass in the retroperitoneum, labeled 'X'. The mass is displacing the kidneys and surrounding structures. A label 'Y' points to the right kidney.

[2]

[4]

③

The diagram illustrates the cellular mechanism for insulin-stimulated glucose uptake. Insulin (represented by a black dot) binds to a receptor on the cell surface membrane. This binding triggers a signaling cascade: the receptor activates PI3K, which in turn activates PKB. PKB then promotes the translocation of GLUT4 transport proteins from a vesicle to the cell surface membrane. Simultaneously, glucose (represented by small circles) is moving through the GLUT4 transporters into the cytoplasm.

[4]

[4]

④

.....

[7]

[Total: 11]

(a) A person with type 2 diabetes and a person without type 2 diabetes were given a glucose drink. The blood glucose concentration of each person was measured at regular intervals for 120 minutes.

The results are shown in Fig. 6.1.

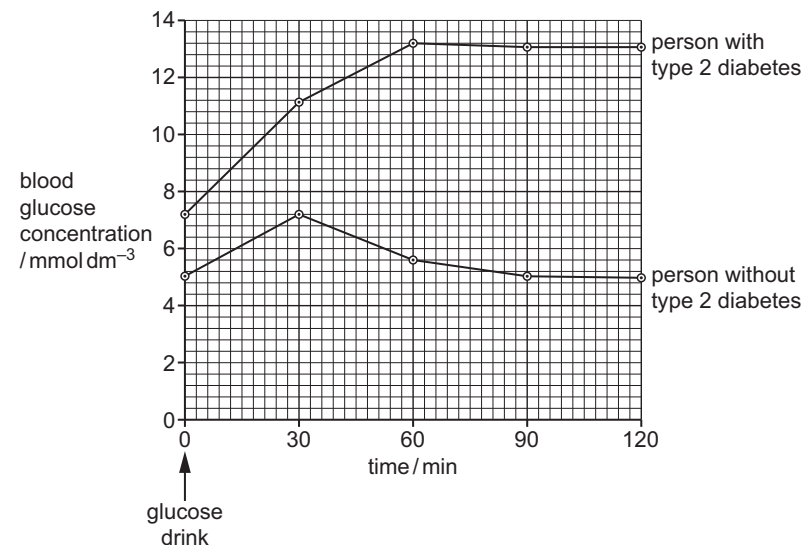


Fig. 6.1

(i) Describe the curve for the person **without** type 2 diabetes.

..... [2]

(ii) Calculate the percentage increase in blood glucose concentration, between 0 and 60 minutes, for the person **with** type 2 diabetes.

answer [2]

..... [2]

..... [7]

7

Table 6.1 describes the movements of molecules at three regions of the nephron, **P**, **Q** and **R**.

region of nephron	molecule(s)	direction of movement
P	amino acids, glucose and water	from nephron to blood
Q	water	from nephron to blood in the presence of antidiuretic hormone (ADH)
R	water and molecules with a molecular mass of less than 68,000	from blood to nephron

P

Q

R

P

Q

R

8

- The student drew the diagram in Fig. 6.1 to show an area that had frozen hard and an area that was softer and less frozen.



[2]

[Total: 8]

- [4]

- Fig. 7.1 shows the results.



- (i) With reference to Fig. 7.1, explain how negative feedback operates to control mean blood glucose concentration in the volunteers who ate meal A.

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..... [4]

- (ii) Suggest explanations for the changes in mean blood glucose concentration of the volunteers who ate meal B.

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..... [3]

[Total: 11]